ATTACHMENT A - CHANGES IN THE CLAIMS

This claims that are amended by this Amendment are shown on the following pages. Bracketed text is material that is deleted from the previous version of the claims, and underlined text is material that is added to the previous version of the claims.

9. (thrice amended) An analog, oligomer-based method for determining a mathematical result of carrying out an operation of vector or matrix algebra on input data,

wherein single-stranded oligomers E_i and $\underline{E}_i$ are a subset of all single-stranded oligomers and are each in 1:1 correspondence with the basis vectors $\boldsymbol{e}_i$, i = 1, 2,..., m in an abstract m-dimensional vector space;

wherein a set of the oligomers E_i and $\underline{E}_i$ represents an m-component vector $\boldsymbol{V} = \Sigma_i V_i \boldsymbol{e}_i$, wherein the E_i and $\underline{E}_i$ oligomers have complementary nucleotide sequences, with the E_i oligomers representing the i-th component of $\boldsymbol{V}$ for which the amplitude V_i is positive, and the $\underline{E}_i$ oligomers representing the i-th component of $\boldsymbol{V}$ for which V_i is negative; and

wherein the concentration of each of the oligomers E_i or $\underline{E}_i$ is proportional to the absolute value of the amplitude V_i of the i-th component of $\boldsymbol{V}$,

the method comprising the steps of

(1) obtaining a composition comprising at least one set of single-stranded oligomers E_i and $\underline{E}_i$ representing the components of a vector that has a component with a positive amplitude and a component with a negative amplitude, wherein the concentrations of the oligomers E_i or $\underline{E}_i$ in the composition are proportional to the absolute values of the amplitudes of the components they

represent, which composition represents input data; and

2) subjecting said composition to at least one physical or chemical treatment having an effect on said oligomers in said composition that is an analog representation of an operation of vector or matrix algebra, and

(3) detecting the effect of said treatment on said oligomers in said composition to determine the analog result of carrying out said operation of vector or matrix algebra on said input data;

wherein said analog result of carrying out said operation of vector or matrix algebra on said input data is quantitatively dependent on the concentrations of said at least one set of single-stranded oligomers E_i and $[E_i]$ $\underline{E_i}$ in said composition.

11. (Thrice amended) The method of claim 10, wherein said at least one physical or chemical treatment in step (2) is selected from the group consisting of (a) changing the relative concentrations of the oligomers in said composition, (b) allowing complementary oligomers in said composition to hybridize to each other, (c) determining the concentration of double-stranded oligomers in the composition, (d) separating double-stranded oligomers from non-double-stranded oligomers in the composition, (e) measuring the rate of hybridization of complementary oligomers in the composition, (f) ligating

oligomers together, (g) adding oligomer subunits to an end of an oligomer in an enzyme-catalyzed reaction, (h) using an oligomer as a template in synthesizing a complementary oligomer sequence in a polymerase-catalyzed reaction, (i) phosphorylating or de-phosphorylating a 5′ terminus of an oligomer[in an enzyme-catalyzed reaction], and ([k]j) cleaving an oligomer with a restriction enzyme.

15. (Twice amended) [The method of claim 11 wherein said operation of matrix algebra is] An analog, oligomer-based method for obtaining the outer product matrix of two vectors V_i for i = 1, 2, ..., m, and W_j for j = 1, 2, ..., n, [and]

wherein single-stranded oligomers E_i and E_i are a subset of all single-stranded oligomers and are each in 1:1 correspondence with the basis vectors e_i, i = 1, 2,..., m in an abstract m-dimensional vector space;

wherein a set of the oligomers E_i and E_i represents an m-component vector $V = \Sigma_i V_i e_i$, wherein the E_i and E_i oligomers have complementary nucleotide sequences, with the E_i oligomers representing the i-th component of V for which the amplitude V_i is positive, and the E_i oligomers representing the i-th component of V for which V_i is negative; and

wherein the concentration of each of the oligomers E_i or E_i

is proportional to the absolute value of the amplitude V_i of the i-th component of V,

said method [comprises] comprising obtaining a set of dimeric, single-stranded oligomers, each of which comprises (i) a first single-stranded oligomer sequence selected from the group consisting of E_i or $\underline{E}_i$ for each i-th component of **V** for i = 1, 2, ... m, which oligomer is joined at its 3' end to the 5' end of (ii) a second single-stranded oligomer sequence selected from the group consisting of E_j or $\underline{E}_j$ for each j-th component of **W** for all j = 1 to j = n,

wherein [said resulting set of single-stranded, dimeric oligomers is an analog representation of the matrix formed as the outer product of said two vectors] the concentration of each of said dimeric oligomers comprising oligomer sequences corresponding to the i-th component of V and the j-th component of W is proportional to the product of the amplitudes of the i-th component of V and the j-th component of W.

24. (Amended) The method of claim [24] 23 wherein said solid support is, or is attached to, a silicon or Al_2O_3 chip.

ATTACHMENT B

Record of the substance of the interview of October 19, 2001.

The interview participants were Ardin Marschel, Primary Examiner, and Charles Rories, Patent Agent, representing Applicants.

Prior to the interview, the examiner was provided with a document stating the proposed amendments to the claims that were to be discussed at the interview.

Claims 9-11, 15, and 17-35 were discussed

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1. To overcome rejection of claims 9-11 as being anticipated by Adleman, Guarnieri, or Oliver, Applicants' representative proposed amending line 20 of claim 9 to specify that the input oligomers comprise oligomers that represent a vector having at least one positive amplitude and at least one negative amplitude. Applicants' representative briefly discussed the methods of the cited prior art references, noting that none of these methods operate with input values of mixed sign, and concluded that claim 9, amended as proposed, would not be anticipated by the methods described in the cited prior art references.

Applicant's representative further proposed amending lines 28 and 29 of claim 9 to recite that the claimed method includes a step of measuring the concentration of at least one oligomer that is the product of the vector or matrix algebra operation, and determining an analog result that is quantitatively based the measured oligomer concentration, if the examiner thought that the present wording of the claim was not satisfactory.

The examiner responded that he would give consideration to whether amendment of claim 9 to recite use of input values of mixed sign would overcome the 102(b) rejection. He also stated that care must be taken in amending claim 9 to use language supported by the specification, so as to avoid introduction of new matter, and that he regarded the present wording of section 3 of claim 9 as definite under 35 USC 112, 2nd paragraph.

2. To overcome rejection of claims 25-26 as being anticipated by Southern, Applicants' representative argued that dimeric oligomers of the claimed methods were

structurally distinct from the DNA molecules disclosed in Southern.

The examiner responded that he regarded Southern as valid prior art, since the collections of oligomers having every possible sequence described in Southern could include the claimed oligomers, but that he would give full consideration to arguments presented.

3. To overcome rejection of claim 11 for new matter, Applicants' representative proposed amending lines 15-16 of claim 11 by deleting the words "in an enzyme-catalyzed reaction" from section (i) to remove the generic phrase that the Examiner has indicated is lacking support. Applicants' representative further proposed amending line 16 of claim 11 by re-designating section (k) as section (j), to correct the informality of having skipped (j) in the recited steps.

The examiner stated that the proposed amendment appeared to overcome the rejection of claim 11 for new matter.

4. To overcome rejection of claim 17 for new matter, Applicants' representative acknowledged that the portions of the specification pointed to in the amendment filed May 19, 2001, taken alone and out of context, do not expressly equate the E_i and E_i strands to the saturating strands. To show that there is support in the specification for the claim element in question, Applicants' representative pointed to (i) line 21 of page 48 to line 3 of page 49, and (ii) lines 3-11 of page 49, which support the equation of the set of E_i and $\underline{E}_i$ strands with the saturating oligomers as recited in claim 17.

The examiner stated that the passages in the specification identified by Applicants' representative appeared to overcome rejection of claim 17 for new matter.

5. Regarding rejection of claims 29-35 for new matter, Applicants' representative stated that these claims were likely to be withdrawn from consideration, without prejudice against their resubmission in a continuation application.

6. Regarding rejection of claim 15 for non-enablement under 35 USC 112, 1st paragraph, Applicants' representative proposed (i) amending the first line of claim 15 to make it

an independent claim, (ii) amending lines 4 and 5 of claim 15 to describe the oligomers E_i and $\underline{E}_i$ as initially recited in claim 9, from which claim 15 formerly depended, and (iii) amending the last three lines of claim 15 to recite that the concentration of each dimeric oligomer, which comprises oligomer sequences corresponding to the i-th component of V and the j-th component of **W**, is proportional to the product of the amplitudes of the i-th component of V and the j-th component of **W**. Applicants' representative pointed to lines 14-16 of page 35 of the specification as supporting the amendment. Applicants' representative also pointed to line 20 of page 33 to line 14 of page 35, and the paragraph bridging pages 14-15, as teaching methods by which one skilled in the art would be able to obtain the recited dimeric oligomers without undue experimentation, in satisfaction of the enablement requirement of 35 USC 112, 1st paragraph.

The examiner stated that the proposed amendment appeared to overcome rejection of claim 15 for non-enablement under 35 USC 112, 1st paragraph.